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Academic Editor

Kappa Delta Pi Record,
49: 56–58, 2013

ISSN: 0022-8958 print/
2163-1611 online
DOI 10.1080/00228958.2013.786588

Conclusions from PISA and TIMSS Testing

Secretary of Education Duncan (2010) lamented the state of U.S. education in 2010 after the release of the results from the 2009 Programme for International Student Assessment (PISA). He wrote:

> Unfortunately, the 2009 PISA results show that American students are poorly prepared to compete in today's knowledge economy. President Obama has repeatedly warned that the nation that "out-educates us today will out-compete us tomorrow." And the PISA results, to be brutally honest, show that a host of developed nations are out-educating us. Finland, Korea, and Canada are consistent high-performers. And the jewel of China's education system, Shanghai, debuted this year as the highest scoring participant globally. (p. 1)

The Secretary issued similar remarks after the release of the results from the Trends in Mathematics and Science Study (TIMSS) in December 2012. He proclaimed (2012):

> Given the vital role that science, technology, engineering, and math play in stimulating innovation and economic growth, it is particularly troubling that eighth-grade science achievement is stagnant and that students in Singapore and Korea are far more likely to perform at advanced levels in science than U.S. students. A number of nations are out-educating us today in the STEM disciplines—and if we as a nation don't turn that around, those nations will soon be out-competing us in a knowledge-based, global economy. (p. 1)

The Secretary's comments insinuate that U.S. students ranked alarmingly behind a set of nations and international cities on the PISA and TIMSS tests in mathematics and science. In this article I provide an alternative interpretation of the data and suggest that rankings on international tests are not what U.S. citizens should worry about if they are concerned about the quality of public education in the United States. As I detail in my book with Don Orlich, *The School Reform Landscape: Fraud, Myth, and Lies* (Tienken & Orlich, 2013), fear mongering seems to be driving an education policy agenda.

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PISA 2009

Children from 65 countries and cities were made to take part in the PISA 2009 mathematics and science testing. The sample sizes for each country or city were approximately 5,000 students. Only 18 countries ranked statistically significantly higher than the United States on the science literacy scale of PISA. That number drops to 15 when I exclude the cities of Hong Kong, Macao China, and Shanghai. None of those cities represent the Chinese public education system, as I will explain in a moment.

The U.S. mean score in science ranked higher than 77% of the mean scores for the countries in the sample. The U.S. mean score in mathematics ranked 24th on the mathematics literacy scale and 21st when I removed those cities. That places the U.S. higher than 67% of the countries in the sample.

I removed Hong Kong and Macao from the sample because they are special administrative regions of the People's Republic of China and their schools do not follow all of the same standardization requirements of the Chinese System (Levin, 2012). I removed Shanghai because it is home to almost 140,000 millionaires, making it the city with the third highest concentration of wealth in China behind Beijing and Guangdong province. Its wealth demographics do not approximate the rest of China, where 29% of the population, more than 392 million people, live on $2 a day or less (World Bank, 2012). Furthermore, educators in Shanghai, Hong Kong, and Macao have more latitude to experiment with teaching strategies and diversified curriculum compared to the Chinese system as a whole.

The public school systems in wealthy Chinese cities are not like U.S.

public school systems. Public school personnel in the United States must enroll any student that lives within a school's jurisdiction. Not so in Shanghai. Wealthy residents can enroll their children in the best schools by paying a fee to the principal. This type of exclusive enrollment pattern results is the creation of super-schools within the system (Levin, 2012).

Glossing Over the Facts

It is simplistic and naïve to look only at the aggregate results from any assessment and believe one is comparing apples to apples. One issue that arises when trying to make comparisons of test scores between groups is that of comparability. The groups must be comparable in terms of the factors that influence standardized test scores. In this case the Secretary is violating two important principles of data interpretation according to Bracey (2006): "When comparing groups, make sure the groups are comparable" (p. 31); and "Watch out for Simpson's Paradox" (p. 62) when the mean of the whole masks important differences within and among subgroups.

Because of (a) selective sampling on the part of some countries, (b) negotiating questions used on the test and the relationship to those questions and a country's curriculum sequence, and (c) lower overall childhood poverty percentages in some countries compared to the 23% child poverty in the United States (about 22% at the time of PISA 2009), many of the country's samples are not comparable in aggregate form (Bracey, 2006; Kids Count, 2010). For example, according to the Organisation for Economic Co-operation and Development ([OECD], 2010), there is a strong correlation between a country's PISA score and how many of that country's negotiated items were included on the test. Is the United States simply bad at item negotiations?

Poverty on PISA

Poverty influences international test results. Riddle (2010) described Gerald Tirozzi's analysis of the influence of poverty on the 2009 PISA results. Tirozzi (as cited in Riddle, 2010) demonstrated that U.S. students from schools with less than 10% poverty score first in the world on the PISA tests, after removing Shanghai. U.S. students from schools with between 10–24.9% poverty score third in the world behind students from Korea and Finland. Keep in mind that every country that outranked the United States in aggregate terms had significantly lower percentages of childhood poverty. But when the national poverty rate becomes a control, U.S. students score at the top in the world, even with the uneven sampling in some countries and lack of curricular alignment between U.S. curricula and PISA. However, the Secretary seemingly chooses to use aggregate data and falls prey to Simpson's Paradox, thereby reporting misinformation.

Sjoberg (2012) provided a detailed accounting of the flaws and weaknesses with the entire PISA project, and I recommend readers access his article for a deeper understanding of the issues that surround PISA results. Zhao (2012) provided compelling evidence of how high ranks on PISA correlate to low levels of creativity in the student population. He raised important questions about whether ranking high on PISA should be a national education goal if U.S. policymakers are worried about economic competitiveness.

TIMSS

The TIMSS 2011 rankings present a problem for Secretary Duncan because U.S. public school students ranked high within the sample of countries and international cities like Hong Kong.

Just the Facts

In science, Grade 4 students in the U.S. sample ranked 7th out of 53 participating countries and cities according to the vendors of TIMSS, the International Association for the Evaluation of Educational Achievement ([IEA], Mullis, Martin, Foy, & Arora, 2012). The mean science score for the U.S. students in Grade 4 ranked higher than approximately 87% of the mean scores of countries in the sample. The mean science score for Grade 8 U.S. students ranked 9th out of 45 participating countries and international cities, or higher than approximately 80% of the mean scores in the sample. U.S. students ranked 6th and 8th in Grades 4 and 8 when I eliminate Hong Kong.

In mathematics, the mean score for Grade 4 students in the U.S. sample ranked 8th out of 53 participating countries and cities, tying Finland. The Grade 8 mean score ranked 7th out of 53 participating countries and international cities. The mean score from Grade 4 students outranked approximately 85% of the sample, and the Grade 8 mean score outranked approximately 87% of the sample (Mullis et al., 2012).

The mathematics results for Grade 8 students are of note because according to the vendors of

the TIMSS, 33% of the questions on the mathematics section contained algebra concepts such as functions and solving equations (Mullis et al., 2012, p. 476). Readers in the United States should remember that not all U.S. students complete Algebra I in Grade 8, but most students do complete it by the time they graduate high school. The vendors of TIMSS acknowledge that there is a curricular mismatch on the test for some nations.

Poverty: Here We Go Again

Just as with the PISA 2009 scores, poverty has a large influence on TIMSS scores and ranks. The U.S. students are at a large disadvantage compared to the majority of the countries in the TIMSS sample because more U.S. students are economically disadvantaged. However, we do have a glimpse of what the rankings from a less poor America could be, because results also were reported for a group of states.

For example, Grade 8 students in Massachusetts (MA), a state with 15% child poverty, participated in the science and mathematics portions of the TIMSS. In science, the MA students achieved a scale score of 567, second only to Singapore at 590 and ahead of such participants as Chinese Taipei, Japan, Hong Kong, Korea, and Finland—all of which have lower rates of childhood poverty (Tienken, 2013). One can see that a decrease of 8 percentage points in U.S. childhood poverty (23% U.S. average versus 15% MA average) increases the U.S. scale score by 41 points and launches the rank to 2nd place on the TIMSS 2011 Grade 8 science portion (Tienken, 2013). in mathematics, students from MA achieved a scale score of 561 compared to the U.S. average of 509—an advantage of 52 scale score points. This difference places the U.S. students into 5th place with Japan (Mullis et al., 2012).

The Real Crisis in Education

Clearly childhood poverty influences ultimate achievement when measured by standardized tests (e.g., Tienken, 2012a, 2012b). If Secretary Duncan wants to improve the rankings of U.S. students on international tests, he should advocate to reduce childhood poverty at least as often as he advocates for corporate control of schools, the use of test scores for teacher accountability, and the standardization and homogenization of knowledge via the Common Core State Standards.

I have not seen any meaningful policy action or leadership from his office toward ending childhood poverty. If this is the best the United States can do in terms of national education leadership, then we have more important things to worry about than rankings on meaningless international tests. I am not aware of any concerted effort on his part to ensure that all women, regardless of socioeconomic status receive high-quality prenatal care. I am not aware of any proposals to have the United States become number one in the world rankings in terms of universal access for children to the world's best health care. I have not seen any programs from the Department of Education aimed at providing students with access to the most stable housing in the world. The Secretary has not put forth any plan or meaningful funding to make the United States number one in the world in terms of food security for children or quality childcare. Unless this country addresses the root cause of underachievement, not much is going to change, and billions of tax payer dollars will be wasted on untested and empirically bankrupt programs like the Common Core State Standards and national testing.

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